triggers local Rac-GTP hydrolysis, thus reducing local actin polymerization required for filopodia formation. ArhGAP44 expression increases as the neuronal network is established and the frequency of exploratory filopodia formation is diminished, suggesting that ArhGAP44 may facilitate the transition of neurons from a dynamic exploratory mode to a mature more static state, a hallmark of nervous system development.
Together, our data reveals a local and receptor-independent auto-regulatory mechanism that limits initiation of exploratory filopodia in neurons via protein recruitment to nanoscale membrane deformations.

1238-Pos Board B189
Role of Surface Tension in the Formation of Membrane Tubes
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The formation of tubular structures is a fundamental morphological change that takes place in biological and reconstituted lipid membranes. Mechanical tension in biological membranes is thought to potentially regulate a number of cellular processes, including cell migration. Here, we explore the impact of surface tension on the formation of membrane tubes using elastic and viscoelastic continuum models of lipid bilayers. In the elastic framework, we demonstrate that application of a point load is sufficient to drive the formation of a tube from an initially flat patch of membrane which undergoes a tent-to-tube transition as a region of negative Gaussian curvature develops at the base of the tube. We generate force vs. displacement curves over several orders of magnitude in the surface tension that display a characteristic overshoot of approximately 13% in the force required to maintain a tube at constant length for all values of surface tension. Additionally, we observe a larger (smaller) linear deformation of the patch relative to the tube radius for a membrane under greater (lesser) tension. We also develop a viscoelastic framework that accounts for lipid flow on the membrane surface on a time scale set by the surface viscosity of the membrane. One key feature of this model is that it expressly allows for the local tension to vary as lipids flow within the plane of the membrane. Using this model we calculate lipid velocity as a function of curvature and local tension during tube formation. Additionally, we make comparisons between the force vs. displacement curves obtained from the viscoelastic model to those obtained via the elastic model.

1239-Pos Board B190
Nanosystem Based on Phospholipids and Surfactants as Innovative Delivery System for Gene Therapy
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Amphiphilic dicationic surfactants, known as gemini surfactants, are currently studied for gene delivery purposes. The biggest advantages of these systems are that they are non-immunogenic and generally have low toxicity. One of the most important advantages of these systems is improved transfection efficiency.
The aim of this study was to determine the possibility to use amphoteric surfactants (zwitterionic derivatives of sulfobetaine with carbohydrate moiety) and sulfobetaine/gemini surfactant mixtures as complexing agents for nucleic acids, with potential applications for gene delivery to reduce the toxicity and improved transfection.
Fourier transform infrared (FTIR) spectroscopy and differential scanning calorimetry (DSC) were used to analyze influence of surfactants on the phase behaviour of 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC) bilayers with the presence of different DNA forms (small DNA oligomers, cDNA, low and high-molecular mass DNA).
The influence of different concentrations of sulfobetaine and sulfobetaine/gemini surfactant mixtures with the presence of DNA on creating stable complexes was investigated using circular dichroism (CD) spectroscopy and electrophoresis.
A series of measurements of toxicity and transfection of these lipoplexes were performed in HeLa cells.
These compounds appear to be excellent for creating complexes with DNA. Thanks to their construction this DNA carrier molecules might be able to deliver genes to the cells of almost any DNA molecular size, unattainable when using viral gene delivery systems. The study was supported by research grant ‘‘GENERACJA PRZYSZŁOŚCI’’ from Ministry of Science and Higher Education (Poland) - decision: 12/POIG/GP/2013.

1240-Pos Board B191
Biophisical Evaluation of Drug Impact on Pulmonary Surfactant Performance
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The respiratory surface of the mammalian’s lung is covered by a thin aqueous layer, and on top of it, by a lipid-protein surface active material, the pulmonary surfactant (PS). It is synthesised by type II pneumocytes and secreted in the form of multilamellar structures. Its main function is to form a film to reduce the surface tension at the air-liquid interface to values below 2mN/m, to prevent pulmonary collapse during expiration and to minimize the work during inspiration. PS has unique biophysical properties to adsorb very rapidly (in few seconds) into the air-liquid interface and, once there, to spread efficiently along it. The pulmonary surfactant system, historically considered as a barrier to drug delivery, could therefore offer novel opportunities to vehiculize different drugs efficiently, while hiding and protecting them from clearence in the lung. Nevertheless, drug impact on pulmonary surfactant performance needs to be considered in a case by case basis when different molecular entities are combined with PS.
In the present work we have investigated the effect of the interaction of an anti-inflammatory steroid and an anti-tuberculosis drug with different pulmonary surfactant preparations, and how drug effects depend on PS composition. After combining properly different surfactant systems with each drug at different drug/lipid ratios, we have evaluated their impact on surfactant function and mechanical properties of surfactant layers, as assessed in a captive bubble surfactometer. Furthermore, we have used the Langmuir-Blodgett technique to prepare supported films and analyse the structure of different drug-loaded surfactant layers in order to detect structural changes associated with the impact of drugs on surfactant activity.

1241-Pos Board B192
Multiscale Simulation of Concentration-Dependant Interaction of Hydrophobic Drug with Cell Membrane
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Cell membranes are often the main and often final barriers for drug delivery. Little is known how hydrophobic drugs such as paclitaxel penetrate through cell membranes. Here we investigate interactions between paclitaxel and a model cellular membrane of palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC) at the molecular level, using multiscale simulation with all-atomistic1 and coarse-grained models. We simulate several multiple systems of POPC bilayer membrane with several different paclitaxel concentrations in the membrane. Additionally, we calculate the free energy profile across the membrane interface, to compare with previously reported experimental measurements. Furthermore, coarse-grained models of the drug are refined2 to match the all-atomistic free energy profile. Along with the corresponding atomistic simulations, the coarse-grained models provide essential tools to investigate the concentration-dependent behavior of the drug in the membrane. For example, we examine the preferred positioning and orientation of the drug, anisotropic directional diffusion and aggregation over the extended timescale and system size. A better understanding of the interactions between hydrophobic drugs and model membranes and their transport will provide molecular-level insights of the drug delivery process.
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1242-Pos Board B193
Stability Regimes and Engulfment Patterns of Nanoparticles at Membranes
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Understanding the interactions between nanoparticles and membranes is essential for many processes such as drug delivery, nano-toxicity or endo- and exocytosis of biological cells. Using a combination of local stability analysis and global energy minimization, we have studied how the membranes’ spontaneous curvature, which describes the asymmetry between the two leaflets of a bilayer, affects the engulfment of nanoparticles by membranes. We